Associations Between Family Support, Family Intimacy, and Neighborhood Violence and Physical Activity in Urban Adolescent Girls

JoAnn Kuo, MPH, Carolyn C. Voorhees, PhD, Jennifer A. Haythornthwaite, PhD, and Deborah Rohm Young, PhD

We examined the association between various dimensions of the family environment, including family intimacy and involvement in activities, family support for physical activity, and neighborhood violence (perceived and objective) and physical activity among urban, predominantly African American, ninth-grade girls in Baltimore, Md. Greater family intimacy ($P=.05$) and support ($P=.01$), but not neighborhood violence, was associated with physical activity. Family factors, including family intimacy and support, are potential targets in physical activity interventions for urban high-school girls. (*Am J Public Health.* 2007;97:101–103. doi:10.2105/AJPH.2005.072348)

Regular physical activity is a health-protecting behavior[1] that declines dramatically during adolescence.[2] According to the social–ecological model, health behaviors are influenced on 5 levels: intrapersonal, interpersonal, institutional, community, and public policy.[3] Physical and social environments interact with individual behavior to support or hinder physical activity, as does neighborhood safety.[4,5] Although parental support is consistently associated with adolescent physical activity,[6] little attention has been given to other aspects of the family environment, such as family intimacy, that are associated with other adolescent health risk behaviors, including condom and drug use.[7] This is the first study we know of to examine the relationship between the broader family environment—including neighborhood

violence and family intimacy and involvement in social and recreational activities—and physical activity among urban adolescent girls.

METHODS

We analyzed baseline data collected from 2000 to 2002 for Project Heart, a comprehensive physical activity randomized trial in an all-girl, citywide, urban high school in Baltimore, Md. In Project Heart, ninth-grade girls were recruited to participate in physical education class; approximately 50% agreed to participate.

We used reliable and validated instruments to assess physical activity and environmental factors.[8–12] After 7 days had passed, a physical activity recall was used to assess total daily energy expenditure, following the methodology of Sallis et al.[8] Perceived threatened or actual violence in the past year was assessed using an exposure-to-violence subscale.[9] Closeness and emotional sharing among family members were assessed using a family intimacy subscale.[10] Family involvement in social and recreational activities[11] and family support for exercise[12] also were assessed using respective subscales.

We obtained the number of violent crimes (i.e., aggravated assault, murder, rape, and robbery) reported citywide in 2000 from the Vital Signs for Baltimore Neighborhoods Report and calculated the rate of violent crime per 1000 residents.[13] Violent crime counts were obtained by occurrence within a community statistical area (defined as a neighborhood cluster created along boundaries of census tracts with similar demographics, income, and education). We used a girl's home address to determine her community statistical area. Each community statistical area had an average of 4691 households. Because neighborhoods are more recognizable to community groups, police, and residents, this approach to measuring crime data may be more amenable to intervention.

Analyses indicated that physical activity and perceived neighborhood violence were skewed, so we performed regression analyses with and without logarithmically transformed data. Final analyses used the transformed physical activity variable and the original violence variable. We examined associations between physical activity and family environmental characteristics after we controlled for mother's education. The results were not affected after we controlled for which parent participants lived with and race/ethnicity; these variables were not included in the final models. We used similar models to compare the association of physical activity to perceived violence (model 1) and violent crime rate (model 2). We used a mixed models approach to construct models with girls nested within community statistical areas (SAS, version 9.1; SAS Institute Inc, Cary, NC).

RESULTS

Participants (N=221) resided in 48 of the 55 community statistical areas in Baltimore. Table 1 presents participant characteristics. Table 2 shows participant responses regarding physical activity for each environmental subscale, as well as the results of the regression analyses. We estimated that a nonactive participant (one who averages 8 hours of sleep and performs no moderate or greater activities per day) would have a total daily energy expenditure of 7.6 kJ/kg/day (32 kcal/kg/day). We found that on average, participants could be classified as nonactive, with a total daily expenditure of 8.3 ±0.71 kJ/kg/day (34.7 ±2.96 kcal/kg/day). Family scales correlated significantly with each other (r_s=0.34–0.42; P<.001). Physical activity correlated significantly with family involvement in activities (r_s=0.17; P<.05), family support (r_s=0.18; P<.01), and perceived neighborhood violence (r_s=0.14, P<.05). Perceived neighborhood violence was positively related to rate of violent crime (r_s=0.23; P=.01).

In regression model 1, family activities (P= .04), family support (P=.03), and family intimacy (P=.004) significantly predicted physical activity. Perceived neighborhood violence was not related to physical activity. Model 2, which used an objective violent crime rate instead of perceived violence, yielded similar results.

TABLE 1—Demographic Characteristics From a Sample of Urban Adolescent Girls (N = 221): Project Heart, Baltimore, Md, 2000–2002

	N	%
Age, y		
13	54	24
14	164	74
15	3	1
Race/ethnicity		
African American	182	83
White	30	14
Other	7	3
Parent with whom participant lives		
Both mother and father	71	32
Mother, not father	123	56
Father, not mother	15	7
Neither mother nor father	12	5
Mother's education		
≤ High school	75	34
≥ Some college	123	56
Not known	22	10
Father's education		
≤ High school	75	34
≥ Some college	80	36
Not known	65	30

Note. Some totals do not equal 100% because of nonresponse.

DISCUSSION

Family support for exercise, family involvement in activities, and general family intimacy may be important predictors of physical activity in adolescent girls. Family intimacy, although overlooked in previous adolescent physical activity research, may be an important factor to evaluate further given its association with adolescent health risk behaviors.[14] Greater parent communication, monitoring, and warmth can affect adolescents' attitudes and beliefs about risk behaviors.[15] Parental monitoring and communication interventions may protect against adolescent risk behavior.[16] Hence, although family intimacy explains a small percentage of the variance in physical activity, it benefits other adolescent behaviors without detrimental effects. Given the current attention to childhood obesity,[17] this is a unique moment during which parents may be more receptive to adolescent physical activity interventions that have parenting components.

Studies on violence and physical activity are inconsistent. Perception of neighborhood crime was associated with less adult physical activity,[4,5] but objectively measured crime was associated with more adolescent physical activity.[18] The neighborhood environment may influence adults and adolescents differently, possibly because environments outside the neighborhood are less accessible to adolescents.

It is not clear why neither perceived violence nor the objective violent crime rate

TABLE 2—Physical Activity, Family Environmental, and Neighborhood Environmental Variables and Regression Results for Urban Adolescent Girls (N = 221): Project Heart, Baltimore, Md, 2000–2002

	No.	Mean Value (SD)	Minimum Value Reported	Maximum Value Reported	Possible Values	*P* Model 1[a]	*P* Model 2[b]
Physical activity[c]	217	8.3 (0.71) kJ/kg/day	7	12	NA[d]	NA[d]	NA[d]
Exposure to violence	217	9.5 (2.89)	7	21	7–35	.68	. . .[e]
Crime rate per 1000	204	22.3 (15.54)	4	145	3–145[e]	. . .[e]	.70
Family intimacy	219	15.8 (4.34)	5	25	5–25	.004	.002
Family involvement in activities	217	5.9 (2.08)	1	9	0–9	.04	.04
Family support	215	30.6 (8.60)	20	59	13–65	.03	.03

[a]Model 1 includes perceived exposure to violence, family intimacy, family involvement in activities, and family support for physical activity, with control for mother's education.
[b]Model 2 includes violent crime rate, family intimacy, family involvement in activities, and family support for physical activity, with control for mother's education.
[c]For comparison with other studies: mean (SD) = 34.7 (2.96) kcal/kg/day, minimum value reported = 31, maximum value reported = 50.
[d]Dependent variable.
[e]Variable was not included in the model.

predicted adolescent physical activity in this study. Perceived crime was expected to predict physical activity better than was objective crime because perceived crime reflects direct exposure to specific types of crime. Because community statistical areas are large, girls may not know about crimes that happened within their community statistical area if those crimes occurred too far from home. The objective crime measurement was made on the basis of reported crimes, which may have underestimated the actual number of crimes that were committed. The overall inactivity of the study population may explain why differences by crime were not detected.

This study had several limitations. Self-report measures could have been biased toward socially desirable responses and were subject to lack of recall. Interviewers used probes to improve girls' recall of their activities, particularly those that were less vigorous in nature. Results may not be generalizable beyond a population of urban, predominantly African American girls.

Our results extend the adolescent physical activity literature and suggest an area for future investigation: the role of aspects of the family environment other than that of family social support, particularly family intimacy and involvement in activities, that also may influence physical activity. Future research should use crime data from smaller geographic levels (e.g., census tract) or weighted for distance from home. Other aspects of the neighborhood that contribute to safety, such as the presence of sidewalks or heavy traffic, may be important factors for adolescent physical activity level. Future research should continue to study additional aspects of the adolescent family and neighborhood environments as possible determinants of physical activity. ■

About the Authors

JoAnn Kuo and Deborah Rohm Young are with the Department of Kinesiology, University of Maryland, College Park. Carolyn C. Voorhees is with the Department of Public and Community Health, University of Maryland, College Park. Jennifer A. Haythornthwaite is with the Department of Psychiatry and Behavioral Sciences, Johns Hopkins Medical Institutions, Baltimore, Md.

Requests for reprints should be sent to JoAnn Kuo, MPH, Department of Kinesiology, University of Maryland, 2351 Health and Human Performance Building, College Park, MD 20742-2611 (e-mail: jkuo1@umd.edu).

This brief was accepted August 15, 2006.

Contributors

J. Kuo led the writing of the brief, performed the data analysis, interpreted the results, and collaborated on the study design. C.C. Voorhees participated in the writing of the brief and collaborated on the study design. J.A. Haythornthwaite helped obtain funding, assisted with interpretation of results, and participated in the writing of the brief. D. Rohm Young obtained funding, supervised the study, assisted with interpretation of results, participated in the writing of the brief, and collaborated on the study design.

Acknowledgments

This study was supported by National Institutes of Health (grant RO1 HL63861).

Human Participant Protection

This study was approved by the internal review boards at Johns Hopkins University and the University of Maryland.

References

1. *Physical Activity and Health: A Report of the Surgeon General.* Atlanta, Ga: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1996.

2. Kimm YS, Glynn NW, Kriska AM, et al. Decline in physical activity in black girls and white girls during adolescence. *N Engl J Med.* 2002;347:709–715.

3. Sallis JF, Owen N. Ecological models of health behavior. In: Glanz K, Rimer BK, Lewis FM, eds. *Health Behavior and Health Education: Theory, Research, and Practice.* 3rd ed. San Francisco, Calif: Jossey-Bass; 2002:462–484.

4. Centers for Disease Control and Prevention. Neighborhood safety and the prevalence of physical inactivity—selected states, 1996. *MMWR Morb Mortal Wkly Rep.* 1999;48:143–146.

5. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J Public Health.* 2001;91:1995–2003.

6. Sallis JF, Prochaska JJ, Taylor WC. A review of correlates of physical activity of children and adolescents. *Med Sci Sports Exerc.* 2000;32:963–975.

7. Stanton B, Li X, Pack R, Cottrell L, Harris C, Burns JM. Longitudinal influence of perceptions of peer and parental factors on African American adolescent risk involvement. *J Urban Health.* 2002;79:536–548.

8. Sallis JF, Haskell WL, Wood PD, et al. Physical activity assessment methodology in the Five-City Project. *Am J Epidemiol.* 1985;121:91–106.

9. Ewart CK, Suchday S. Discovering how urban poverty and violence affect health: development and validation of a neighborhood stress index. *Health Psychol.* 2002;21:254–262.

10. Dickinson WP, deGruy FV, Dickinson LM, Mullins HS, Acker S, Gilmer V. The family systems assessment tool. *Fam Syst Health.* 1996;14:57–71.

11. Moos RH, Moos BS. *Family Environment Scale Manual.* Palo Alto, Calif: Center for Health Care Evaluation, Department of Veteran Affairs and Stanford University Medical Centers; 1994.

12. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Prev Med.* 1987;16:825–836.

13. *Vital Signs for Baltimore Neighborhoods Report.* Baltimore, Md: Baltimore Neighborhood Indicators Alliance, Jacob France Institute, University of Baltimore; 2002.

14. DeVore ER, Ginsburg KR. The protective effects of good parenting on adolescents. *Curr Opin Pediatr.* 2005;17:460–465.

15. Cleveland MJ, Gibbons FX, Gerrard M, Pomery EA, Brody GH. The impact of parenting on risk cognitions and risk behavior: a study of mediation and moderation in a panel of African American adolescents. *Child Dev.* 2005;76:900–916.

16. Wu Y, Stanton BF, Galbraith J, et al. Sustaining and broadening intervention impact: a longitudinal randomized trial of 3 adolescent risk reduction approaches. *Pediatrics.* 2003;111:E32–E38.

17. Dietz WH. Overweight in childhood and adolescence. *N Engl J Med.* 2004;350:855–857.

18. Gordon-Larsen P, McMurray RG, Popkin BM. Determinants of adolescent physical activity and inactivity patterns. *Pediatrics.* 2000;105:E83.